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NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS

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PRESSURE-DISTRIBUTION MEASUREMENTS OF A LOW-DRAG AIRFOIL
WITH SLOTTED FLAP SUBMITTED BY CURTISS-WRIGHT CORPORATION

By I. H. Abbott

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MEMORANDUM REPORT

for the

Materiel Division, Army Air Corps

PRESSURE-DISTRIBUTION MEASUREMENTS OF A LOW-DRAG AIRFOIL
WITH SLOTTED FLAP SUBMITTED BY CURTISS-WRIGHT CORPORATION

By I. H. ABBOTT

INTRODUCTION

Pressure-distribution measurements were made at the request of the Materiel Division, U. S. Army Air Corps, on a 24-inch-chord wooden model equipped with a slotted flap and submitted by the Curtiss-Wright Corporation. The tests were made in the Langley two-dimensional tunnel at a Reynolds number of about 5,600,000.

The model was the one described in reference 1 and represented a wing section of the P-60A airplane. The model was equipped with a 0.25c slotted flap with the lip on the upper airfoil surface at approximately 90 percent of the airfoil chord. The model was equipped with pressure-distribution orifices.

RESULTS AND DISCUSSION

Pressure-distribution diagrams are presented in figures 1 to 5 for the model at about -16° , 0° , and 16° with a flap deflection of 15° , and for angles of attack of 0° and 12° for a flap deflection of 30° . Pressures are plotted directly as obtained from the manometer in terms of 1/2-inch units of carbon tetrachloride. The abscissa is the projection on the chord line of the pressure orifices. The values of the corrected dynamic pressure q and the impact pressure level in terms of the same units are given on each figure. The static pressure level is obtained by adding the value of q to the impact pressure level. The value $\left(\frac{v}{V}\right)^2$, where v is the local velocity and V is the free-stream velocity, is obtained by dividing the local pressure, measured from the impact pressure level, by the value of q .

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The normal-force coefficient, as obtained by integration of the pressure diagrams, is given on each figure and is in essential agreement with the lift coefficients presented in reference 1. Moment coefficients about the quarter-chord point are also presented as obtained for integration of the diagrams. These moment coefficients do not contain the component of moment due to the chord force which may be appreciable, especially at the larger flap deflection.

The projections of the pressure orifices of the model on the chord are given in table I in percentage of chord for flap deflections of 0° , 15° , and 30° .

Langley Memorial Aeronautical Laboratory,
National Advisory Committee for Aeronautics,
Langley Field, Va., December 11, 1941.

REFERENCE

1. Abbott, I. H.: Lift and Drag Characteristics of a Low-Drag Airfoil Model with Slotted Flap Submitted by Curtiss-Wright Corporation. NACA MR, Dec. 2, 1941.

TABLE I

PROJECTION ON CHORD OF PRESSURE ORIFICES
CURTISS-WRIGHT 24-INCH CHORD FLAP MODEL FOR P60-A AIRPLANE

| Airfoil | | | |
|--------------------------|---------------|---------------|---------------|
| Upper Surface | | Lower Surface | |
| Orifice No. | Percent Chord | Orifice No. | Percent Chord |
| L.E. | 0 | | |
| 1T | .83 | 1B | .91 |
| 2T | 2.45 | 2B | 2.62 |
| 3T | 5.16 | 3B | 5.10 |
| 4T | 7.61 | 4B | 7.57 |
| 5T | 10.06 | 5B | 10.17 |
| 6T | 15.08 | 6B | 15.13 |
| 7T | 19.99 | 7B | 20.15 |
| 8T | 25.05 | 8B | 25.15 |
| 9T | 30.05 | 9B | 30.17 |
| 10T | 35.06 | 10B | 35.05 |
| 11T | 40.00 | 11B | 40.08 |
| 12T | 45.12 | 12B | 45.10 |
| 13T | 50.10 | 13B | 50.04 |
| 14T | 54.95 | 14B | 55.00 |
| 15T | 59.99 | 15B | 60.26 |
| 16T | 65.10 | 16B | 64.93 |
| 17T | 70.06 | 17B | 69.90 |
| 18T | 75.00 | 18B | 75.04 |
| 19T | 80.15 | 19B | 75.80 |
| 20T | 85.10 | 20B | 77.95 |
| | | 21B | 80.90 |
| | | 22B | 82.39 |
| | | 23B | 83.72 |
| Flap, $\delta = 0^\circ$ | | | |
| L.E. | 75.35 | | |
| 1FT | 75.90 | 1FB | 76.09 |
| 2FT | 76.92 | 2FB | 77.05 |
| 3FT | 78.85 | 3FB | 78.96 |
| 4FT | 82.40 | 4FB | 82.54 |
| 5FT | 85.00 | 5FB | 84.91 |
| 6FT | 87.50 | 6FB | 87.40 |
| 7FT | 89.98 | 7FB | 89.90 |
| 8FT | 93.30 | 8FB | 93.14 |
| 9FT | 96.33 | 9FB | 97.01 |
| | | T.E. | 100.00 |

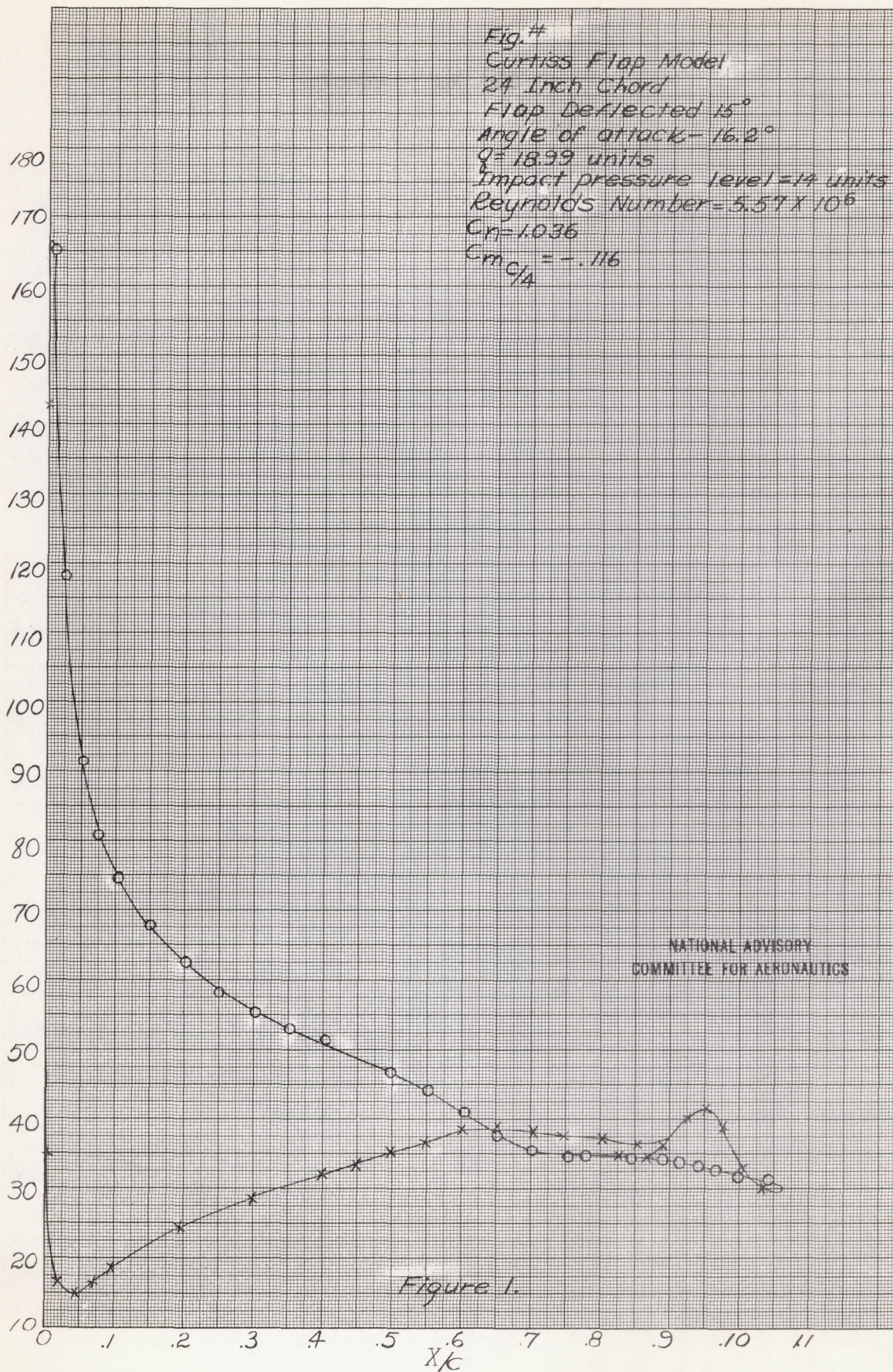
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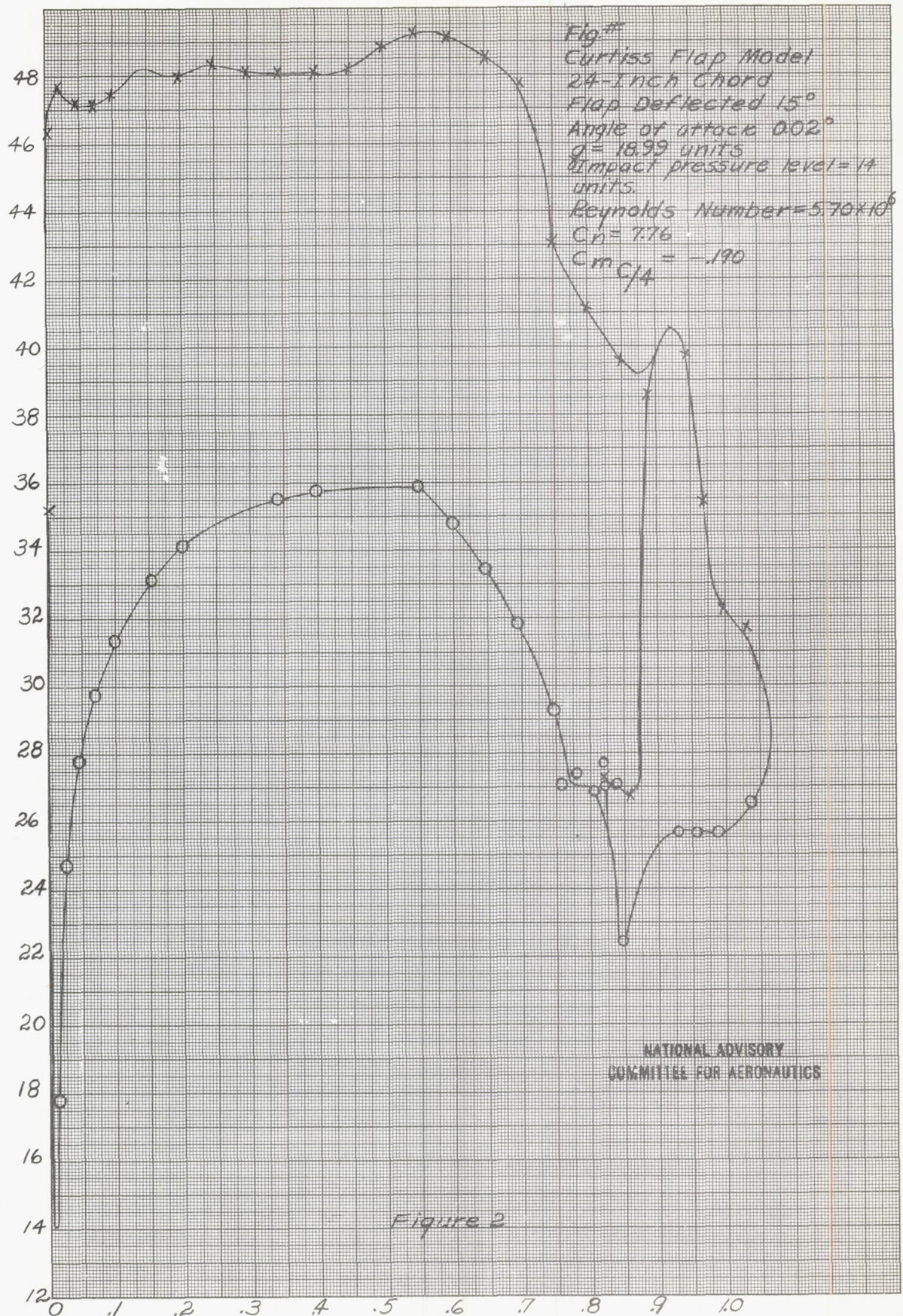
TABLE I (Concluded)

PROJECTION ON CHORD OF PRESSURE ORIFICES

| Flap, $\delta = 15^\circ$ | | | |
|---------------------------|---------------|---------------|---------------|
| Upper Surface | | Lower Surface | |
| Orifice No. | Percent Chord | Orifice No. | Percent Chord |
| L.E. | 81.75 | | |
| 1FT | 82.50 | 1FB | 82.13 |
| 2FT | 83.72 | 2FB | 82.95 |
| 3FT | 86.10 | 3FB | 84.89 |
| 4FT | 89.65 | 4FB | 88.55 |
| 5FT | 92.20 | 5FB | 91.05 |
| 6FT | 94.70 | 6FB | 93.65 |
| 7FT | 97.08 | 7FB | 96.20 |
| 8FT | 100.00 | 8FB | 99.53 |
| 9FT | 102.85 | 9FB | 103.40 |
| | | T.E. | 106.22 |
| Flap, $\delta = 30^\circ$ | | | |
| L.E. | 88.72 | | |
| 1FT | 89.70 | 1FB | 88.78 |
| 2FT | 91.11 | 2FB | 89.44 |
| 3FT | 93.60 | 3FB | 91.19 |
| 4FT | 97.17 | 4FB | 94.72 |
| 5FT | 99.58 | 5FB | 97.05 |
| 6FT | 101.70 | 6FB | 99.54 |
| 7FT | 103.70 | 7FB | 102.00 |
| 8FT | 106.23 | 8FB | 105.15 |
| 9FT | 108.60 | 9FB | 108.81 |
| | | T.E. | 111.51 |

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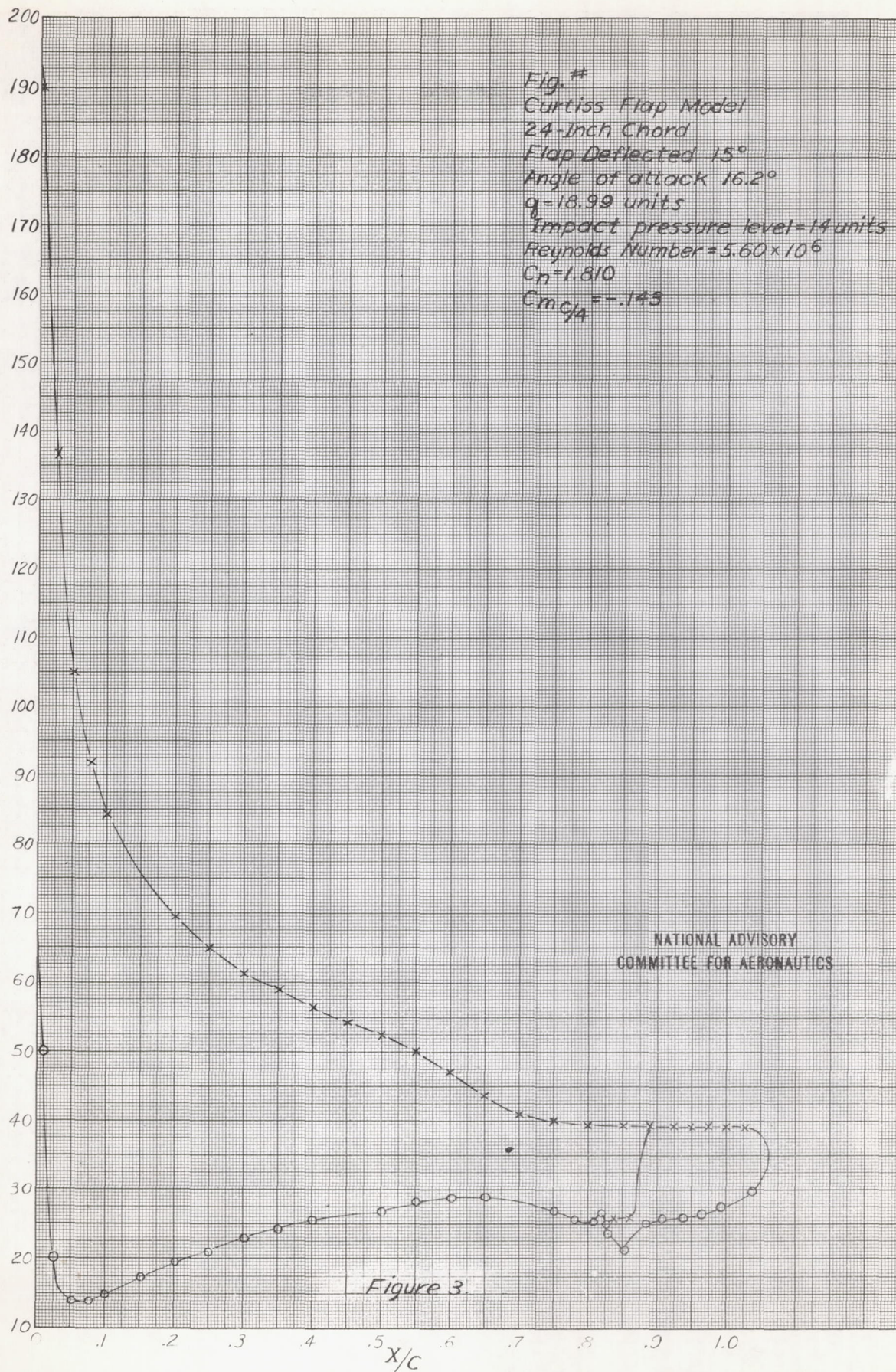


Fig. #
 Curtiss Flap Model
 24 inch chord
 Flap Deflected 30°
 Angle of attack $= 0^\circ$
 $q = 18.99$ units
 Impact pressure level $= 10$ units
 Reynolds Number $= 5.69 \times 10^6$
 $C_n = 1.477$
 $C_{m/c/4} = -.481$

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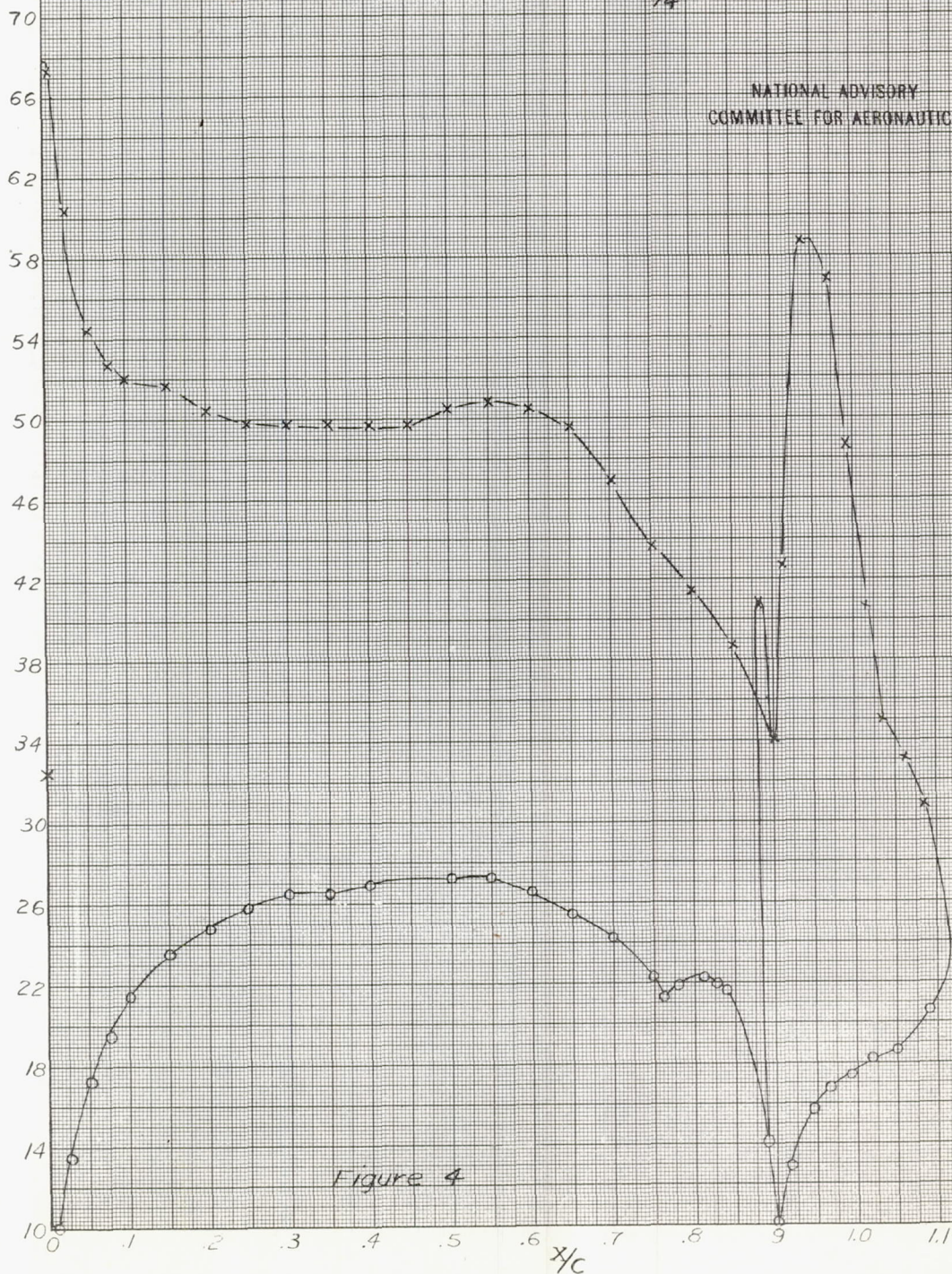


Figure 4

